We claim:

1. A method of transmitting data in a wireless MC-CDMA system to a set of M users comprising the steps of:

Providing a transmitter system with N sub-carriers divided into G groups.

determining the instantaneous group SNR calculated using an effective channel function for each user in each group of sub-carriers.

for each user and in each group of sub-carriers, using the instantaneous SNR of an equivalent single sub-carrier as a metric for resource allocation at the transmitter.

2. A method as in claim 1, further comprising:

receiving the data at the MC-CDMA receiver, and

demodulating the received data using a demodulator that corresponds to the resource allocated at the transmitter.

3. A method according to claim 1, in which said data bits are modulated with a modulation scheme corresponding to said group SNR and spread in frequency over said sub-carriers belonging to said group.

4. A method according to claim 3, for each user comparing the instantaneous group SNR of each group of sub-carriers with a pre-defined set of switching thresholds to determine the bit allocations for the equivalent sub-carrier, and modulating each equivalent sub-carrier with a corresponding number of data bits, corresponding to said group SNR.

5. A method according to claim 3, for each user using the instantaneous group SNR of each group of sub-carriers, calculating the bit and power allocation for each equivalent sub-carrier and modulating each equivalent

sub-carrier with a corresponding number of data bits, corresponding to said group SNR.

6. A method according to claim 1, further comprising the step of, for each user and in each group of sub-carriers, regarding the instantaneous group SNR as the instantaneous SNR of an equivalent single sub-carrier to the group.

7. A method according to claim 4, in which any groups of sub-carriers having a group SNR below a switching threshold are not modulated;

at least one group of sub-carriers having a first group SNR above said switching threshold is modulated with a first number of data bits according to a first modulation scheme; and

at least one group of sub-carriers of said G groups having a second group SNR next above said first group SNR is modulated with a second number of data bits according to a second modulation scheme; and

the remaining members of said G groups of sub-carriers above thresholds separating group SNR regions are modulated with corresponding numbers of data bits according to corresponding modulation schemes.

8. A method according to claim 4, in which at least one switching threshold between at least two SNRs is chosen to satisfy a performance criterion of a system.

9. A method according to claim 7, in which user data bits for each user in each group of sub-carriers are modulated by a modulation scheme corresponding to the group SNR, then spread with a spreading code associated with that user, and loaded into the sub-carriers of the group.

10. A method according to claim 9 further comprising repeating the steps of modulating said user data bits according to said group SNR and spreading for every user in the system.

11. A method according to claim 10, further comprising a step of adding the chips from all users synchronously across all the sub-carriers in said G groups, on a sub-carrier-by-sub-carrier basis and then transmitting an OFDM symbol formed by the addition of said chips.

12. A method according to claim 3, further comprising a step of calculating for each user an effective channel function;

Calculating from said effective channel function a group SNR of the sub-carriers in said effective channel function; and

comparing the instantaneous group SNR of each group of sub-carriers with a pre-defined set of switching thresholds to determine the bit allocations for the equivalent sub-carrier, and modulating each equivalent sub-carrier with a corresponding number of data bits, corresponding to said group SNR.

13. A method according to claim 12, further comprising the step of, for each user and in each group of sub-carriers, regarding the instantaneous group SNR as the instantaneous SNR of an equivalent single sub-carrier to the group.

14. A method according to claim 12, in which any groups of sub-carriers having a group SNR below a switching threshold are not modulated;

at least one group of sub-carriers having a first group SNR above said switching threshold is modulated with a first number of data bits according to a first modulation scheme; and

at least one group of sub-carriers of said G groups having a second group SNR next above said first group SNR is modulated with a second number of data bits according to a second modulation scheme; and

the remaining members of said G groups of sub-carriers above thresholds separating group SNR regions are modulated with corresponding numbers of data bits according to corresponding modulation schemes.

15. A method according to claim 12, in which at least one switching threshold between at least two SNRs is chosen to satisfy a performance criterion of a system.

16. A method according to claim 14, in which user data bits for each user receiving each group of sub-carriers are modulated by a modulation scheme corresponding to the group SNR, then spread with a spreading code associated with that user, and loaded into the sub-carriers of the group.

17. A method according to claim 16 further comprising repeating the steps of modulating said user data bits according to said group SNR and spreading for every user in the system.

18. A method according to claim 17, further comprising a step of adding the chips from all users synchronously across all the sub-carriers in said G groups, on a sub-carrier-by-sub-carrier basis and then transmitting an OFDM symbol formed by the addition of said chips.

19. A wireless MC-CDMA system for transmitting data to a set of M users comprising:

a transmitter with N sub-carriers divided into G groups, said transmitter having a modulator for modulating said N sub-carriers .

Each of said G groups having an instantaneous group SNR calculated using an effective channel function for each user in each group of sub-carriers; and

Resource allocation means at said transmitter for allocating, using said instantaneous SNR of an equivalent single sub-carrier as a metric, at least one resource for each user and in each group of sub-carriers.

20. A system as in claim 19, further comprising:

at least one MC-CDMA receiver for receiving the data, and

a demodulator that corresponds to the resource allocated at the transmitter for demodulating the received data..

21. A system according to claim 19, in which said data bits are modulated with a modulation scheme corresponding to said group SNR, spread in frequency over said sub-carriers belonging to said group.

22. A system according to claim 21, further comprising means for comparing the instantaneous group SNR of each group of sub-carriers received by each user with a pre-defined set of switching thresholds to determine the bit allocations for the equivalent sub-carriers of said each user; and

Modulation means for modulating each equivalent sub-carrier with a corresponding number of data bits, corresponding to said group SNR.

23. A system according to claim 21, further comprising means for calculating the bit and power allocation, for each user using the instantaneous group SNR of each group of sub-carriers, for each equivalent sub-carrier and modulating each equivalent sub-carrier with a corresponding number of data bits, corresponding to said group SNR.

24. A system according to claim 19, in which, for each user and in each group of sub-carriers, said SNR is calculated by regarding said instantaneous group SNR as the instantaneous SNR of an equivalent single sub-carrier.

25. A system according to claim 22, in which any groups of sub-carriers having a group SNR below a switching threshold are not modulated;

At least one group of sub-carriers having a first group SNR above said switching threshold is modulated with a first number of data bits according to a first modulation scheme; and

at least one group of sub-carriers of said G groups having a second group SNR next above said first group SNR is modulated with a second number of data bits according to a second modulation scheme; and

the remaining members of said G groups of sub-carriers above thresholds separating group SNR regions are modulated with corresponding numbers of data bits according to corresponding modulation schemes.

26. A system according to claim 22, in which at least one switching threshold between at least two SNRs is chosen to satisfy a performance criterion of a system.

27.A system according to claim 25, in which user data bits for each user in each group of sub-carriers are modulated by a modulation scheme corresponding to the group SNR, then spread with a spreading code associated with that user, and loaded into the sub-carriers of the group.

28. A system according to claim 27, further comprising means for repeating the steps of modulating said user data bits according to said group SNR and spreading for every user in the system.

29. A system according to claim 28, further comprising means for adding the chips from all users synchronously across all the sub-carriers in said G groups, on a sub-carrier-by-sub-carrier basis and then transmitting an OFDM symbol formed by the addition of said chips.

30. A system according to claim 19, further comprising means for calculating for each user said effective channel function and calculating therefrom said group SNR of the sub-carriers in said effective channel function.

31. A system as in claim 30, further comprising:

at least one MC-CDMA receiver for receiving the data, and

a demodulator that corresponds to the resource allocated at the transmitter for demodulating the received data.

32. A system according to claim 30, in which said data bits are modulated with a modulation scheme corresponding to said group SNR, spread in frequency over said sub-carriers belonging to said group.

33. A system according to claim 32, further comprising means for comparing the instantaneous group SNR of each group of sub-carriers received by each user with a pre-defined set of switching thresholds to determine the bit allocations for the equivalent sub-carriers of said each user; and

Modulation means for modulating each equivalent sub-carrier with a corresponding number of data bits, corresponding to said group SNR.

34. A system according to claim 32, further comprising means for calculating the bit and power allocation, for each user using the instantaneous group SNR of each group of sub-carriers, for each equivalent sub-carrier and modulating each equivalent sub-carrier with a corresponding number of data bits, corresponding to said group SNR.

35. A system according to claim 30, in which, for each user and in each group of sub-carriers, said SNR is calculated by regarding said instantaneous group SNR as the instantaneous SNR of an equivalent single sub-carrier.

36. A system according to claim 33, in which any groups of sub-carriers having a group SNR below a switching threshold are not modulated;

At least one group of sub-carriers having a first group SNR above said switching threshold is modulated with a first number of data bits according to a first modulation scheme; and

at least one group of sub-carriers of said G groups having a second group SNR next above said first group SNR is modulated with a second number of data bits according to a second modulation scheme ; and the remaining members of said G groups of sub-carriers above thresholds separating group SNR regions are modulated with corresponding numbers of data bits according to corresponding modulation schemes.

37. A system according to claim 33, in which at least one switching threshold between at least two SNRs is chosen to satisfy a performance criterion of a system.

38. A system according to claim 36, in which user data bits for each user in each group of sub-carriers are modulated by a modulation scheme corresponding to the group SNR, then spread with a spreading code associated with that user, and loaded into the sub-carriers of the group.

39. A system according to claim 38, further comprising means for repeating the steps of modulating said user data bits according to said group SNR and spreading for every user in the system.

40. A system according to claim 39, further comprising means for adding the chips from all users synchronously across all the sub-carriers in said G groups, on a sub-carrier-by-sub-carrier basis and then transmitting an OFDM symbol formed by the addition of said chips.